



## The Effect of Walking and Yoga on Blood Glucose Levels in Type II Diabetes

Leili Yekefallah<sup>1</sup>, Hamideh Azimi<sup>2\*</sup>, Tahereh Sadeghi<sup>3</sup>, Mahya Roustaei<sup>4</sup>

<sup>1</sup>Assistant Professor, Faculty of Nursing and Midwifery, Department of Nursing, Qazvin University of Medical Sciences, Qazvin, Iran, Email: Leili\_fallah@yahoo.com

<sup>2</sup>MSc of Medical Surgical Nursing, School of Nursing and Midwifery, Iran Medical Science University, Tehran, Iran

<sup>3</sup>Assistance Professor of Mashhad Nursing and Midwifery School, Mashhad Medical Science University, Mashhad, Iran. Email: Tahereh.sadeghi@yahoo.com

<sup>4</sup>Civil Engineering Department, Islamic Azad University, Qazvin Branch, Qazvin, Iran, Email: Mahya\_roustaei@yahoo.com, Address: Post Box: 13185-1678 Tehran, Iran

### ABSTRACT

**Background and aims:** Diabetes is a metabolic disease cause to interfere in normal metabolism. Diabetes can't be cured, but it can be controlled by other methods including: safe exercise (Yoga- walking ...). The aim of the this study was to determine the effect of one-month regular Yoga and walking exercise on blood sugar levels in type 2 diabetic patients. **Method:** This Semi-Experimental study was conducted on 60 volunteer with diabetic type 2. The Participants randomly were divided in to 3 groups: 20 patients on any group (yoga, walking, and control). Yoga and walking groups practiced for 45 minutes daily for 30 days. Data were analyzed using spss win 16. P-value was considered less than 0.05 as significance criteria. **Results:** The differences according to age, sex, and education level and number of tablet were not significant ( $p > 0.05$ ). The initial Fast Blood glucose didn't show significant difference ( $p > 0.05$ ). After 1 month, the difference between blood glucose was significant in yoga and walking groups and between yoga and control groups. However, this difference was not significantly between walking and control group. Number of tablet between the three groups was not significant after 1 month ( $p > 0.05$ ). In 3 groups a significant difference was observed in Fast Blood glucose on bases repeated measurement test. ( $p < 0.05$ ) **Conclusion:** According to the findings, a month of exercise (yoga - walking) was effective in reducing blood glucose levels and in compare between yoga and walking, yoga exercise is more effective in reducing blood glucose levels.

**Keywords** Blood Glucose; Yoga; Walking; Diabetes.

### INTRODUCTION

Diabetes mellitus does not have a single definition. Diabetes is a complex chronic illness that Cause to interfere in normal metabolism (carbohydrates, fats and proteins). Diabetes has Complication on Micro vascular and Macro vascular (1).

In other words, Diabetes is a metabolic disorder (2). Research was conducted in 2009 by Aziminezhad which demonstrated that almost 190 million people are with diabetes in the world and is predicted to be near 330 million in 2025 (3). Also, obesity and reduced physical activity increase the prevalence of type2 diabetes (1-4). The prevalence of type 2 diabetes is near 1.2% to 14.6% in Asia 6.4% to 40% in Middle East, and 1.3% to 14.7% in Iran (3). The research conducted in 2008 by Azimineghad; indicate that 5/8% of women and 5/1% of men have diabetes (3).

Diabetes can't be cured, but it can be controlled by other methods, such as exercise (5-6). Yoga is a series

of physical and breathing and stretching exercises (6-7). There is a relationship significant between mind and health. The base of yoga is, create an adjustment between mental healths (psychology – nervous) with physical health to increase the quality of life (7).

Physical practicing in yoga, increase the blood circulation that at this why increase, oxygen absorption and hormonal system performance .also relaxation in yoga cause to improve the autonomous nervous system functional (7). Ross's study(2010) showed that yoga can be useful in reducing pain(37%), fatigue (25%), sleep disturbance,55%,and cholesterol(25%)compared to other methods(8). In a comparative study, which was conducted in 2010, yoga was shown as an effective exercise to improve glucose (9-10), lipid profiles (10) and stress (10-11). Yoga is more effective in reducing fatigue, increasing balance and social functioning (8). In Study of Aljasir (2008) results indicate that yoga is helpful in upper than 50% of patients with diabetes (12). Exercise and walking are two excellent ways to control Type 2 diabetes and health promotion for people with diabetes (13). As walking 10,000 steps foot or 5 miles a day can reduce take up insulin almost 25%, (13). Studies show that walking 3-4 times per week, 30-

\* Corresponding Author

Hamideh Azimi

Email: H.Azimi88@Yahoo.Com

60 minutes each time can be effective in reducing blood glucose in diabetics (14-15-16).in yoga all part of joints are used but it isn't in other sports. Yoga is shown to be more capable than any other sport. Thus, the aim of this study is to compare walking with Yoga effects on blood glucose level in patients' with type 2 diabetes.

## MATERIAL AND METHOD

This study was conducted in republic Islamic of Iran in Qazvin city in 2012. In this Semi-experimental study, According to the study criterion (person must have type 2 diabetes and taking pills (metformin 500mg – glibenclamide 5mg) to control of their disease. Persons must sign up testimonial and their age was between 30-55 years.) and final criterion of study (Person who had muscle -skeletal –heart-vessels and breathes disease and had problems in doing physical exercises. Persons who encountered problems in time of research and have to use Insulin or couldn't do exercise), To allocate 60 ( according to past study \* and formula) patients(male -female),30-55year old patients with Type 2 diabetes were randomly stratified assigned to three groups yoga, walking and control. Each sample were assigned a number, The first patients were used in the yoga group, two patients in walking groups and third patient in control group and so on.

\* The Effects of Free-Living Interval-Walking Training on Glycemic Control,Body Composition, and Physical Fitness in Type 2 Diabetes Patients. Writer: KRISTIAN KARSTOFT(2012)

\* Effect of yoga asana and pranayama in non-insulin depenent diabetes mellitus. Writer:V.Malhotra(2003)

$$n = \frac{2 \left( z_{1-\frac{\alpha}{2}} + z_{1-\beta} \right)^2 \delta^2}{d^2}$$

$$n = \frac{2(1.96 + 0.85)^2}{17^2} 19.5^2 = 20.7$$

$$\alpha_1=0.05 \quad z_{1-\frac{\alpha}{2}} = 1.96 \quad d=17$$

$$1-\beta = 0.80 \quad z_{1-\beta} = 0.84 \quad \sigma = 19.5$$

This article was confirmed in Iranian Registry of Clinical Trials (IRCT201107247101N1) and Qazvin medical university (number d/6/3659)

Study's purpose explained and one written testimonial certified.

We have used a Questionnaire which was validated by a dissertation in Qazvin University of Medical Sciences. Questionnaire justifiability was approved by faculty of Qazvin University of Medical Sciences including 15 persons with expertise of coach and PhD student. Also questionnaire durability was approved by the test tri-

ple in 10 samples within 3 weeks later who were not involved in the study.

After providing written consent from all individuals, we have measure are variables in each group, a questionnaire containing 15 questions (4questions about demographics-6questions are about diabetes history and 5 questions are about sports history).

The groups were randomly selected for our three groups by drawing method. Patients were tested twice for FBS. (One day before the first day of training—one day after the final day training course). The patient was told to fast at least 8 hour prior to Fast Blood glucose checking. Blood glucose was measured by glucometer (ZD) (GM300).

## PROTOCOLS OF THE GROUPS

Educational programs and laws that were registered for walking was as follow: After breakfast walking must be done for 30 days in the morning and 45 minutes daily. These persons did exercise in a same place and same time.

They were not permitted to eat food or desert with exception of water also were not allowed to listen to music. (Due to lack of uniform environmental conditions in both groups), and they had to answer the questions regarding their walking method. We had at raining program for the yoga group was as follow: After breakfast yoga exercises must be done for 30 days in the morning and for 45 minutes daily. A Single Yoga exercises instructor performed similar lessons through all sessions.

## STATISTICAL ANALYSIS

All data were entered and analyzed by SPSS version 16. The data were tested for normal distribution by One-Sample Kolmogorov-Smirnov Test. The Levin test for equality of variances was tested. For comparing the data, independent samples T-test, paired samples T-test, ANOVA, Post hoc test and chi2 were used, a p-value less than 0.05 was considered as significant.

## RESULTS

Mean ageing in 3 group was 46 years .There was no significant age difference among groups.(p=0.793)(Table1).

From 60 persons of 3 group, 25 (41%) were men and 35(58%) were female There was no significant gender difference among groups (p = 0.937). (Table1)

Most people in the yoga group (35%) had secondary level education. Most people in the Walking groups (30%) and controls (40%) had primary level education .there was no statistical difference between the groups in levels of education. (P = 0.765)

Among the three groups of subjects ((45%) 24) were taking 2 tablets daily. there was no statistical differ-

ence between the groups in count of pills that consume in 24 hour (Table2)

The initial FBS was not significantly different; however, In 3 groups a significant difference was observed in FBS on bases repeated measurement test. ( $p=0.024$ ) with difference was mainly seen between Yoga and control groups. (Table3)

Blood glucose significantly decrease in the yoga groups ( $p=0.017$ ) however, the other groups did not have any Significant difference after the intervention. ( $p=0.097$ ) (Table 4)

Number of tablet between the three groups was not significant before and after 1 month ( $p>0.05$ ) ( $p=0.291$ )

## DISCUSSION

In this study, a month of regular exercise, yoga and walking on blood glucose levels of people with type2 diabetes had a significant impact. This findings are in agreement with many other studies that show yoga and walking have positive effects on blood glucose levels (2-6-12-17-18). Each of these studies have been performed in a singles port. In this study most people were 46 years. Which was similar to Haghdoost's study (2009) which said the diabetes between 40-60 is higher than another years (19)

This is because with increasing age, activity decreases and weight gain increases patients and causes fat storage and weight gain around the abdomen and upper body, especially in women after menopause. Activity and less weight gain, reduce body insulin action and insulin resistance occur (20)

In this study, in all three groups, women were more than men. These results are consisting with the results of Azimineghad's study (2008) that the prevalence of diabetes was 5.8% among women and 5.1% among men the prevalence of diabetes (3). In Haghdoost's study (2009) had 1.7% more women than men (19). It seems that women in Iran spend most of their time at home and does Minimal physical activity at this why increase the body fat, it making them more prone to diabetes (3-19).

In this study most people who have studied in elementary school have diabetes and this result is consistent with the results of Azimineghad's study, he noted that the prevalence of diabetes is higher in people with low literacy (3). Due to loss of knowledge related to the diabetes (what is the prevention or treatment), diabetes is the more in this level of education.

According to the study, based on a month of exercise (yoga -walking) on blood glucose levels, according to study results and the comparison between the discriminate variables, the impact of one month of yoga exercise to reduce blood glucose levels was significant ( $P=0.004$ ). Though walking group was reduced but not statistically significant ( $P=0.12$ ).

Many studies have shown yoga improving diabetes. Some of them have mentioned up to upper than 50 percent of the beneficial effects of treating diabetes with yoga (12) Evidence shown that yoga can have a therapeutic effect on type 2 diabetes. The present study compared yoga with walking groups and control, blood glucose levels in the yoga group showed a significant decrease compared to walking. In many studies yoga have decrease blood glucose (2-6-12-17-18). In similar studies, such as: Amita's study (2009) of glucose decreased 159 to 137. (2) But in Skoro's study (2005) Yoga has no significant effect on blood glucose (21). In general seems to yoga cause to reproduce pancreatic cells. Increase fat percent, cause to decrease in sensitivity to insulin and higher insulin resistance but don't worry because yoga causes to decrease the fat percent (22). Yoga causes to decrease free fatty acid, it that to improve  $\beta$  cell function. (23) Walking group, blood glucose levels were lower than the control group, but the difference was not significant, walking group had less loss than yoga group. In Karstoft's study (2008) walking cause to lowers blood glucose- triglyceride (14). This result wasn't consistent with the results of Karstoft's study. This was due to consume level of calorie and the time of intervention (45 minute). The variable Number of tablet, after the intervention in any of the three groups, no difference was observed. Normand's (2011) and Sharoff's (2010) study suggested that the combination of metformin treatment and exercise does not reduce blood glucose. As a result, the number pills will not reduce (24-25). These results are consistent with the results of the present study. In Saha's study (2007) of 20 patients with diabetes who were 50-66 years old, the results indicated that the average tablets from 1.47 to 0.55 reached (23). These results are not consistent with the results of the present study. Perhaps this lack of consistency is due to the interference term.

According to the findings, 1 month of exercise (yoga -walking) was effective in reducing blood glucose levels comparing yoga and walking. According to Authors' Hypothesis: Yoga exercise effective in improving blood glucose levels than walking. In yoga all part of joints are used but it isn't in other sports. Yoga is shown to be more capable than any other sport in significant reduction in blood glucose level. Thus, the aim of this study is to compare walking with Yoga effects on blood glucose in patients' with type 2 diabetes. This type of exercise can be helpful for patients And on the other hand due to the many available free walking exercise, the authors concluded that exercise (yoga -walking) improve the physical health of people with diabetes promoting sense of health and education departments in the medical community should be considered.

## ACKNOWLEDGEMENTS

We would like to express our sincere thanks to Qazvin Province Yoga Society, especially Mrs. Mahya Roustaei, instructor, and also to the Vice-Chancellor for Research

of Qazvin University of Medical Sciences for their helpful support in conducting this study.

#### FINANCIAL DISCLOSURE

Dr Bahram Mehrtash reported receiving research grants and consulting fees for speaking from Qazvin University Medical Sciences. Bualli Hospital Laboratory reported receiving for Buying Our Laboratory Equipment from Qazvin University Medical Sciences.

#### FUNDING/SUPPORT

This study was supported in part by Qazvin University Medical Sciences and by Authors of this article (Hamideh Azimi and Leili Yekkeh Fallah).

**Table 1: Comparison of gender and age groups**

| group              | mean age  | gender             |                   |
|--------------------|-----------|--------------------|-------------------|
|                    |           | N and p of male    | N and p of female |
| yoga               | 47.6±6.21 | 8 (40%)            | 12 (60%)          |
| walking            | 45.8±10.0 | 8 (40%)            | 12 (60%)          |
| control            | 46.9±7.8  | 9 (45%)            | 11 (55%)          |
| total              | 46.8±8.0  | 25 (41.7%)         | 35 (58.3%)        |
| P value<br>p=0.793 |           | P value<br>p=0.937 |                   |

N and p: The number and percentage

**Table 2: Comparison of Number Of Tablet (metformin – glibenclamid) groups**

| group   | Number Of Tablet (metformin – glibenclamid) |          |         |         |          |          |          |
|---------|---|----------|---------|---------|----------|----------|----------|
|         | 1.00  | 2.00     | 3.00    | 4.00    | 5.00     | 6.00>    | Total    |
| yoga    | 2 (10%)                                     | 9 (45%)  | 3 (15%) | 2 (10%) | 2 (10%)  | 2 (10%)  | 20(100%) |
| Walking | 6(30%)                                      | 6 (30%)  | 2 (10%) | 3 (15%) | 1 (5%)   | 2 (10%)  | 20(100%) |
| control | 4 (20%)                                     | 9 (45%)  | 1 (5%)  | 4 (20%) | 1 (5%)   | 1 (5%)   | 20(100%) |
| Total   | 12 (20%)                                    | 24 (40%) | 6 (10%) | 9 (15%) | 4 (6/7%) | 5 (8/3%) | 60(100%) |

This table showed : count of pills that consume in 24 hour

**Table 3: Comparison of the Blood Sugar intervention groups together**

| Variable | Group   | Mean±SD    | F     | P Value |
|----------|---------|------------|-------|---------|
| BG(1)    | Yoga    | 162.3±43.2 | 2.965 | .060    |
|          | Walking | 217.7±90.7 |       |         |
|          | Control | 190.7±73.7 |       |         |
| BG(2)    | Yoga    | 137.5±34.8 | 3.970 | .024    |
|          | Walking | 194.7±89.7 |       |         |
|          | Control | 194.0±83.6 |       |         |
|          |         |            |       |         |

BG 1: Blood Glucose (early intervention)

BG2: Blood Glucose (end intervention)

**Table 4: Comparison of blood glucose in the intervention group**

| Dependent variables                   | Group   |         | mean      | Standard deviation | p.value | 95% Confidence level |             |
|---------------------------------------|---------|---------|-----------|--------------------|---------|----------------------|-------------|
|                                       |         |         |           |                    |         | Lower Bound          | Upper Bound |
| Blood Glucose (after of intervention) | yoga    | walking | -57.150   | 23.277             | .017    | -103.761             | -10.538     |
|                                       |         | control | -56.450   | 23.277             | .018    | -103.061             | -9.838      |
|                                       | walking | yoga    | 57.150*   | 23.277             | .017    | 10.538               | 103.761     |
|                                       |         | control | .700      | 23.277             | .976    | -45.911              | 47.311      |
|                                       | control | yoga    | 56.45000* | 23.27717           | .018    | 9.8383               | 103.0617    |
|                                       |         | walking | -.70000   | 23.27717           | .976    | -47.3117             | 45.9117     |

**REFERENCES**

- [1] Brunner and Svders, Translated by Asadi Nvqaby.AA, Dehghan Nayeri .N, Book liver and glands - 2010 : pp 155- 166.
- [2] Amita.S, Prabhakar.S, Manoj.I , et al.Effect Of Yoga –Nidra On Blood Glucose Level In Diabetic Patients, 2009;53(1):97-101.
- [3] Azimi –Nezhad. M . Ghayour-Mobarhan. M, Parizadeh. MR,et al,Prevalence of type 2 diabetes mellitus in iran and its relationship with gender,urbanization,education, marital statusand occupation,Singapore Med J, 2008;49(7);571.
- [4] Gill.Jason MR, Cooper Ashley R. Physical Activity and Prevention of TYPE 2 Diabetes Mellitus,Sports Medicine:2008;38(10):807-824.
- [5] Innes .KE, Vincent .HK, The influence of yoga-based programs on risk profiles in adults with type 2 diabetes mellitus, a systematic Review,Evid Based Complement Alternat Med, 2007;4:469-486.
- [6] Yang K, Bernardo LM, Sereika SM, Conroy MB, Balk J, Burke LE. Utilization of 3-month yoga program for adults at high risk for type 2 diabetes: a pilot study.School of Nursing, University of Pittsburgh, Pittsburgh- Evid Based Complement Alternat Med.;2011:257891.
- [7] Hadi Ne ,Hadi Na, Effects of hatha yoga on well-being in healthadults in shiraz Islamic republic of iran,Eastern Mediterranean health journal,2007: Vol:13-No:7.
- [8] Ross A, Thomas S, The health benefits of yoga and exercise,areview of comparision studies.Alternative and complementary medicine,2010;16(1):3-12
- [9] Gordon LA,Morrison EY ,Mcgrowder DA,et al. Effect of exercise therapy on lipid profile and oxidative stress indicators in patients with type 2 diabetes,BMC Complement Altern Med, 2008;8:article21
- [10] Sinha S, Singh SN ,Monga YP,et al.Improvement of glutathione and total antioxidant status with yoga .J Alternat Complement Med.2007;13:1085-1090
- [11] Hagins M, Moore W ,Rundle A,Dose practicing hatha yoga satisfy recommendations for intensity of physical activity which improves and maintains health and cardiovascularfitness BMC Complement Alter Med,2007;7:1
- [12] Aljasir B, Bryson M, Al-shehri B. Yoga Practice for the Management of Type II Diabetes Mellitus in Adults: A systematic review . Evid Based Complement Alternat Med. 2010 December; 7(4): 399–408.
- [13] Loretod CH DI, Fanelli C. makes your diabetic patients walk: long –term impact of different amounts of physical activity on type2 diabetics’ .diabetes care.2005; 28:1295-1302.
- [14] Karstoft K, Winding K, Knudsen S H, Nielsen J S,Thomsen C, Pedersen B K, et al.The Effects of Free-Living Interval-Walking Training on Glycemic Control, BodyComposition, and Physical Fitness in Type 2 Diabetes Patients .A randomized, controlled trial. Diabetes Care(care.diabetesjournals.org ).2012;pp1-9.
- [15] Praet SF, van Rooij ES, Wijtvliet A, et al.Brisk walking compared with an individualized medical fitness programme for patients with type 2 diabetes: a randomized controlled trial. Diabetologia 2008; 51:736–746
- [16] Tjønnå AE, Lee SJ, Rognmo O, et al.Aerobic interval training versus continuous moderate exercise as a treatment for the metabolic syndrome: a pilot study. Circulation 2008;118:346–354.
- [17] Lee JA, Kim JW, Kim DY. Effects of yoga exercise on serum adiponectin and metabolic syndrome factors in obese postmenopausal women. Menopause. 2012 Mar;19(3):296-301.
- [18] McCaffrey R, Ruknui P, Hatthakit U, Kasetsoomboon P. The effects of yoga on hypertensive persons in Thailand. Holistic nursing practice. 2005;19(4):173–180.
- [19] Haghdoost A A, Rezazadeh- Kermani M , Sadghirad B ,Baradaran HR.Prevalence of type 2 diabetes in the Islamic Republic of Iran: systematic review and

meta-analysis-Eastern Mediterranean Health Journal; 2009, 15 (3).

- [20] Afkhami Ardekani M, Rashidi M - Risk Factors For Type 2 Diabetes - Journal of Isfahan University of Medical Sciences – 2007;4 ( 4): 348 to 365.
- [21] Skoro Kondza L, See Tai Sh, Gadelrab R, Drincevic D , Greenhalgh T .Community based yoga classes for type 2 diabetes: an exploratory randomized controlled trial- BMC Health Services Research 2009, 9:33-45
- [22] Kyizom t, Singh S,Singh K P , Tandon OP , Kumar R . Effect of pranayama & yoga-asana on cognitive brain functions in type 2 diabetes-P3 event related evoked potential (ERP) - Indian J Med Res 131, May 2010, pp 636-640.
- [23] 23- Sahay BK - Role of Yoga in Diabetes-J Assoc Physicians india 2007 Feb-pp 121-126.
- [24] Normand G, Boulé Cheri R, Gordon J, et al, Metformin and Exercise in Type 2 Diabetes- US National Library of Medicine National Institutes of Health , 2011: v34(7):90-8.
- [25] Sharoff. CG, Hagobian .TA, Malin .SK .et al, Combining short-term metformin treatment and one bout of exercise does not increase insulin action in insulin-resistant individuals, Am J Physiol Endocrinol Metab, 2010: 298(4):815-23.